Predecessor Serial No.: 09/830,396
Group Art Unit No.: Not Yet Assigned

Amendments to the Claims:

1. (Original) Analytical apparatus comprising:

a piezoelectric sensor; and

an oscillator circuit, coupled to the sensor to oscillate at a frequency substantially determined by a resonant frequency of the sensor, and to provide an output signal at the oscillator frequency at an output;

characterised in that

the oscillator circuit incorporates means to maintain a substantially constant drive signal to the piezoelectric sensor.

2. (Original) Apparatus as claimed in claim 1 wherein the oscillator circuit includes an amplifier with feedback coupling the output to an input of the amplifier to form a feedback loop through the amplifier, and wherein the feedback loop incorporates automatic gain control (AGC) means.

3. (Original) Apparatus as claimed in claim 2 further comprising a second output to provide an output signal corresponding to a gain control signal of the AGC means.

4. (Amended) Apparatus as claimed in claim 2 ~~or 3~~ wherein the AGC means comprises rectification means, integrator means and variable gain means responsive to the integrator means.

5. (Amended) Apparatus as claimed in ~~any preceding claim~~ claim 1 wherein the piezoelectric sensor has two terminals, both of which are actively driven.

6. (Amended) Apparatus as claimed ~~any preceding claim~~ claim 1 wherein the drive signal is substantially sinusoidal.

7. (Original) Apparatus as claimed in claim 6 wherein all elements in the feedback loop providing signal gain and attenuation are configured to operate in a substantially linear mode.

8. (Amended) Apparatus as claimed in ~~any one of claims 2 to 7~~ claim 2 wherein the oscillator circuit incorporates a second feedback loop comprising filter means.

9. (Amended) Apparatus as claimed in ~~any preceding claim~~ claim 1 wherein the piezoelectric sensor comprises a quartz crystal.

10. (Original) Apparatus as claimed in claim 9 wherein a structure or compound which interacts with a material of chemical or biological origin is attached to a surface of the crystal or to an electrode on the crystal.

11. (Cancelled)

12. (Amended) Apparatus as claimed in in ~~any preceding claim~~ claim 1 when used with at least part of a surface of the sensor in contact with a liquid.

13. (Amended) Use of the apparatus of ~~any one of claims 1 to 10~~ claim 1 to measure a density of a liquid.

14. (Amended) Use of the apparatus of ~~any one of claims 1 to 10~~ claim 1 to measure a viscosity of a liquid.

15. (Amended) Use of the apparatus of ~~any one of claims 1 to 10~~ claim 1 to detect an interaction between a cell and a target material.

16. (Amended) Use of the apparatus of ~~any one of claims 1 to 10~~ claim 1 to detect a titre of anitbody-antigen agglutination.

17. (Amended) Use of the apparatus of ~~any one of claims 1 to 10~~ claim 1 to monitor, in solution, a bacterial characteristic.

18. (Amended) Use of the apparatus of ~~any one of claims 1 to 10~~ claim 1 to measure the concentration of bacteria in a solution.

19. (Original) Analytical apparatus comprising:

a piezoelectric sensor; and

an oscillator circuit, coupled to the sensor to oscillate at a frequency substantially determined by a resonant frequency of the sensor, and to provide an output signal at the oscillator frequency;

characterised in that

the oscillator circuit comprises means to provide a second output signal correlated to the 'Q' of the sensor.

20. (Original) Apparatus as claimed in claim 19 wherein the means to provide the second output comprises means to sense the level of the first output signal and to provide an output level sense signal and variable gain means responsive to said output level sense signal to maintain a substantially constant first output signal level, said output level sense signal comprising the second output signal.

21. (Original) A method of measuring a characteristic of an oscillating piezoelectric sensor in a fluid medium comprising:

providing an oscillating drive signal to the sensor; and

characterised in that

the method further comprises controlling the drive signal such that it is maintained at an approximately constant level despite changes in the fluid medium.

22. (Original) A method as claimed in claim 21 wherein the changes are changes in the density of the fluid medium.

23. (Amended) A method as claimed in claim 21 ~~or 22~~ wherein the measured characteristic is the frequency of oscillation of the sensor.

24. (Amended) A method as claimed in claim 21 ~~or 22~~ comprising measuring the 'Q' of the sensor.

25. (Amended) A method as claimed in ~~any one of claims 21 to 24~~ claim 21 wherein the fluid is a liquid.

26. (Original) A method as claimed in claim 25 wherein the liquid is flowing.

27. (Amended) A method of detecting cells or biochemically active compounds using the method of ~~any one of claims 21 to 26~~ claim 21.

28. (Original) An oscillator circuit comprising a piezoelectric sensor, to oscillate at a frequency substantially determined by a resonant frequency of the sensor and to provide an output signal at the oscillator frequency at an output, the circuit comprising:

an amplifier with feedback coupling to the output to an input of the amplifier to form a feedback loop through the amplifier; and

characterised in that

the feedback loop incorporates automatic gain control (AGC) means to maintain a substantially constant drive signal to the piezoelectric sensor.

29. (Original) A circuit as claimed in claim 28 wherein the AGC means also operates to control the loop gain to reduce variations in the output signal level.

30. (Amended) A circuit as claimed in claim 28 ~~or 29~~ further comprising a second output corresponding to a gain control signal of the AGC means.

31. (Amended) A circuit as claimed in ~~any one of claims 28 to 30~~ claim 28 wherein all elements in the feedback loop providing signal gain and attenuation are configured to operate in a substantially linear mode.

32. (New) Use of the apparatus of claim 1 to conduct an immunoassay.